AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A MEMS device, the MEMS device comprising:
a substrate having a surface,
an actuable element at least partially formed from the substrate, and
an electromagnetic MEMS actuator disposed on the substrate for selectively applying a first force to the actuable element to displace the actuable element along a path.

2. (Original) The MEMS device of claim 1, wherein the actuable element has a base and an arm coupled thereto, the base of the actuable element including a portion comprised of a magnetic material.

3. (Original) The MEMS device of claim 2, wherein the magnetic material is comprised of at least one of a permanent magnetic material and a soft magnetic material.

4. (Original) The MEMS device of claim 2, wherein the magnetic material is comprised of at least one of ferrites, remalloy, vicalloy, AlNiCo, Co, CoPt, a rare earth metal, NiFe (permalloy), CoFe (permendur), CoZr, FeN, AlSiFe (sendust), NiFeMo (supermalloy), NiFeCuCr (mumetal), NiFeCo, CoFeB, CoFeV (supermendur), CoFeCr (hiperco), CoZrTa, FeAlN, FeTaN, and combinations thereof.

5. (Original) The MEMS device of claim 2, wherein the portion of the base comprised of a magnetic material has a length in a direction substantially parallel to the path and a cross-section having a first extent, the first extent of the cross-section varying over the length.

6. (Original) The MEMS device of claim 2, wherein the portion of the base comprised of a magnetic material has a length in a direction substantially parallel to the path and a cross-section having a first extent, the first extent of the cross-section being substantially constant over the length.

7. (Currently Amended) The MEMS device of claim 6, wherein the electromagnetic MEMS actuator comprises an electrically conductive coil.

8. (Original) The MEMS device of claim 7, wherein the path of the actuable element passes through a gap in the coil.

9. (Original) The MEMS device of claim 7, wherein the coil is comprised of a conductive material having a resistivity less than approximately 1×10^{-7} Ωm at 20° C.

10. (Original) The MEMS device of claim 7, wherein the coil is comprised of at least one of copper, aluminum, gold, silver, and alloys thereof.

11. (Original) The MEMS device of claim 7, wherein the coil has an inductance of at least approximately 50 nH.

12. (Original) The MEMS device of claim 7, wherein the coil has a circumference and a cross-section having a first extent, the first extent of the cross-section being substantially constant over the circumference.

13. (Original) The MEMS device of claim 7, wherein the coil has a circumference and a cross-section having a first extent, the first extent of the cross-section varying over the circumference.

14. (Currently Amended) The MEMS device of claim 7, wherein the electromagnetic <u>MEMS</u> actuator further comprises a magnetic core about which the electrically conductive core is wound.

15. (Original) The MEMS device of claim 14, wherein the core has a magnetic permeability of at least approximately 4×10^3.

16. (Original) The MEMS device of claim 14, wherein the core is comprised of a soft magnetic material.

17. (Original) The MEMS device of claim 16, wherein the soft magnetic material includes at least one of NiFe (permalloy), CoFe (permendur), CoZr, FeN, AlSiFe (sendust),

NiFeMo (supermalloy), NiFeCuCr (mumetal), NiFeCo, CoFeB, CoFeV (supermendur), CoFeCr (hiperco), CoZrTa, FeAlN, FeTaN, and combinations thereof.

18. (Original) The MEMS device of claim 14, wherein the core has a circumference and a cross-section having a first extent, the first extent of the cross-section being substantially constant over the circumference.

19. (Original) The MEMS device of claim 14, wherein the core has a circumference and a cross-section having a first extent, the first extent of the cross-section varying over the circumference.

20. (Original) The MEMS device of claim 14, wherein the core has a first core end and a second core end, the first core end and the second core end being separated by a core gap, the path of the actuable element extending at least partially into the core gap.

21. (Original) The MEMS device of claim 20, wherein the core gap has an extent in a direction substantially perpendicular to the path of at least approximately 5 μm.

22. (Original) The MEMS device of claim 20, wherein the coil has a first coil end and a second coil end, the first coil end and the second coil end being separated by a coil gap, the coil gap having an extent equal to or greater than an extent of the core gap.

23. (Original) The MEMS device of claim 14, wherein the coil continuously covers at least approximately 80% of the surface area of the core.

24. (Original) The MEMS device of claim 14, wherein the coil includes at least ten windings about the core.

25. (Original) The MEMS device of claim 1, wherein the path extends substantially parallel to the substantially planar surface of the substrate.

26. (Original) The MEMS device of claim 1, further comprising a clamp for selectively clamping the actuable element at a desired position on the path.

27. (Original) The MEMS device of claim 26, wherein the clamp is coupled to at least one of the MEMS actuator and the actuable element.

28. (Original) The MEMS device of claim 1, further comprising a stop for selectively inhibiting displacement of the actuable element beyond a desired position on the path.

29. (Original) The MEMS device of claim 28, wherein the stop is coupled to the substrate.

30. (Original) The MEMS device of claim 28, wherein the stop comprises a wall disposed on the substrate, the wall protruding at least partially into the path.

31. (Original) The MEMS device of claim 1, further comprising a control mechanism operable to selectively apply a second force to the actuable element in a direction opposite to the first force.

32. (Original) The MEMS device of claim 31, wherein the control mechanism is formed from the substrate.

33. (Original) The MEMS device of claim 32, wherein the control mechanism is coupled to the actuable element at one end and the substrate at another end.

34. (Original) The MEMS device of claim 31, wherein the control mechanism comprises at least one cantilever.

35. (Original) The MEMS device of claim 34, wherein the at least one cantilever extends substantially parallel to the surface of the substrate.

36. (Original) The MEMS device of claim 34, wherein the control mechanism comprises a plurality of cantilevers.

37. (Original) The MEMS device of claim 36, wherein the actuable element has a first side, and the plurality of cantilevers are coupled to the first side.

38. (Original) The MEMS device of claim 36, wherein the actuable element has a first side and a second side disposed opposite to the first side and at least one cantilever is coupled to the first side and at least one cantilever is coupled to the second side.

39. (Original) The MEMS device of claim 38, wherein at least one cantilever coupled to the first side of the actuable element is substantially coaxial with at least one cantilever coupled to the second side of the actuable element.

40. (Original) The MEMS device of claim 31, wherein the control mechanism comprises at least one spring coupled to the actuable element at one end and the substrate at another end.

41. (Original) The MEMS device of claim 31, wherein the control mechanism comprises a plurality of springs, each spring coupled at one end to the actuable element and at another end to the substrate.

42. (Original) The MEMS device of claim 31, wherein the control mechanism comprises a second MEMS actuator.

43. (Original) The MEMS device of claim 42, wherein the second MEMS actuator is a second electromagnetic MEMS actuator.

44. (Original) The MEMS device of claim 43, wherein the second electromagnetic MEMS actuator includes a magnetic core and an electrically conductive coil wound about the core.

45. (Original) The MEMS device of claim 1, wherein the MEMS device has an extent in a direction substantially perpendicular to the surface of the substrate of less than approximately 50 μm.

46. (Original) The MEMS device of claim 1, further comprising a suspension mechanism for selectively controlling the location of the actuable element in a direction substantially perpendicular to the surface of the substrate.

47. (Original) The MEMS device of claim 46, wherein the suspension mechanism comprises at least one of one or more clamps, one or more springs, or one or more cantilevers.

48. (Original) The MEMS device of claim 46, wherein the suspension mechanism comprises one or more permanent magnets.

49. (Original) The MEMS device of claim 46, wherein the suspension mechanism comprises one or more electromagnets.

50. (Currently Amended) A MEMS device comprising:

a substrate,

an actuable element,

a ~~an~~ MEMS actuator disposed on the substrate for selectively applying a first force to the actuable element to displace the actuable element along a path, and

at least one cantilever coupled to the actuable element at one end and the substrate at another end to control displacement of the actuable element along the path.

51. (Currently Amended) The MEMS device of claim 50, wherein the MEMS actuator is disposed on the surface of the substrate.

52. (Original) The MEMS device of claim 50, wherein the actuable element includes an optical element for attenuating an optical beam lying in the path.

53. (Original) The MEMS device of claim 52, wherein the optical beam comprises at least one of a light beam and a particle beam.

54. (Original) The MEMS device of claim 52, wherein the optical beam lies in a plane substantially parallel to the surface of the substrate.

55. (Original) The MEMS device of claim 54, wherein the optical beam lies in a plane substantially perpendicular to the surface of the substrate.

56. (Original) The MEMS device of claim 50, wherein the optical element is a shutter for selectively blocking the optical beam.

57. (Original) The MEMS device of claim 56, wherein the shutter includes at least one of an opaque, a semi-transparent, a semi-reflective, and a reflective surface.

58. (Original) The MEMS device of claim 50, wherein the at least one cantilever extends substantially parallel to the surface of the substrate.

59. (Original) The MEMS device of claim 50, wherein the actuable element has a first side, and a plurality of cantilevers are coupled to the first side.

60. (Original) The MEMS device of claim 50, wherein the actuable element has a first side and a second side disposed opposite to the first side, and at least one cantilever is coupled to the first side and at least one cantilever is coupled to the second side.

61. (Original) The MEMS device of claim 60, wherein at least one cantilever coupled to the first side is substantially coaxial with at least one cantilever coupled to the second side.

62. (Original) The MEMS device of claim 50, wherein at least a portion of the actuable element is formed from the substrate.

63. (Original) The MEMS device of claim 50, wherein at least a portion of the cantilever is formed from the substrate.

64. (Original) A MEMS device comprising:

a substrate,

first and second actuable elements,

a first MEMS actuator for selectively applying a first force to the first actuable element to displace the first actuable element along a first path,

a second MEMS actuator for selectively applying a second force to the second actuable element to displace the second actuable element along a second path,

a first cantilever coupled to the first actuable element for controlling the displacement of the first actuable element along the first path, and

a second cantilever coupled to the second actuable element for controlling the displacement of the second actuable element along the second path.

65. (Original) The MEMS device of claim 64, further comprising a first optical element coupled to the first actuable element and a second optical element coupled to the second actuable element.

66. (Original) The MEMS device of claim 65, wherein the first path and the second path are positioned to intersect an optical beam.

67. (Original) The MEMS device of claim 66, wherein the first optical element and the second optical element may each be selectively displaced along the first and second path, respectively, to selectively attenuate the optical beam.

68. (Original) A MEMS device disposed on a substrate having at least a top layer, the MEMS device comprising:

an actuable element comprising a base and a generally elongated arm extending from the base, the base including a magnetic material, at least a portion of the actuable element being formed from the top layer of the substrate, and

an electromagnetic MEMS actuator comprising an electrically conductive coil arranged to generate a magnetic field within a gap formed by spaced apart ends of the coil upon application of a current to the coil, the base of the actuable element being positioned proximate the gap such that the actuable element can be displaced relative to the gap upon application of the magnetic field on the magnetic material.

69. (Original) A MEMS device disposed on a substrate, the MEMS device comprising:

an actuable element comprising a base and a generally elongated arm extending from the base, the base including a magnetic material,

an electromagnetic MEMS actuator comprising an electrically conductive coil arranged to generate a magnetic field within a gap formed by spaced apart ends of the coil upon application of a current to the coil, the base of the actuable element being positioned proximate the gap such that the actuable element can be displaced relative to the gap upon application of the magnetic field on the magnetic material, and

a cantilever attached to the substrate at one end and the arm of the actuable element at another end.

70-107. (Withdrawn)